

CLAIMS**What is claimed is:**

- 1 1. A method for producing sophorolipids having spermicidal and/or
2 antiviral properties comprising the steps of:
 - 3 a. synthesizing the sophorolipid by fermentation of *Candida bombicola* in
4 a fermentation media to form a natural mixture of lactonic sophorolipids and non-
5 lactonic sophorolipids;
 - 6 b. utilizing the natural mixture as a spermicidal and/or antiviral agent;
 - 7 c. separating the lactonic sophorolipids from the natural mixture to form a
8 lactonic fraction and mixing all remaining fractions to form a non-lactonic fraction;
 - 9 d. utilizing the lactonic fraction as an spermicidal and/or antiviral agent;
10 and
 - 11 e. utilizing the non-lactonic fraction as a spermicidal and/or antiviral
12 agent.
- 1 2. A method for producing sophorolipids having spermicidal and/or
2 antiviral properties comprising the steps of:
 - 3 a. synthesizing the sophorolipid by fermentation of *Candida bombicola* in
4 a fermentation media to form a natural mixture of lactonic sophorolipids and non-
5 lactonic sophorolipids; and
 - 6 b. utilizing the natural mixture as a spermicidal and/or antiviral agent.
- 1 3. A method for producing sophorolipids having spermicidal and/or
2 antiviral properties comprising the steps of:
 - 3 a. synthesizing the sophorolipid by fermentation of *Candida bombicola* in
4 a fermentation media to form a natural mixture of lactonic sophorolipids and non-
5 lactonic sophorolipids;
 - 6 b. separating the lactonic sophorolipids from the natural mixture to form a
7 lactonic fraction and mixing all remaining fractions to form a non-lactonic fraction;
8 and
 - 9 c. utilizing the lactonic fraction as an spermicidal and/or antiviral agent.
- 1 4. A method for producing sophorolipids having spermicidal and/or
2 antiviral properties comprising the steps of:

3 a. synthesizing the sophorolipid by fermentation of *Candida bombicola* in
4 a fermentation media to form a natural mixture of lactonic sophorolipids and non-
5 lactonic sophorolipids;

6 b. separating the lactonic sophorolipids from the natural mixture to form a
7 lactonic fraction and mixing all remaining fractions to form a non-lactonic fraction;
8 and

9 c. utilizing the non-lactonic fraction as an spermicidal and/or antiviral
10 agent.

1 5. The method as claimed in Claim 1, wherein the sophorolipid is 17-L-[
2 (2'-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate based.

1 6. The method as claimed in Claim 5, wherein the 17-L-[
2 (2'-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate based sophorolipid is
3 selected from the group consisting of 17-L-[
4 (2'-O-β-D-glucopyranosyl-β-D-
5 glucopyranosyl)-oxy]-cis-9-octadecenoate-6',6"-diacetate, Hexyl 17-L[
6 (2'-O-β-D-
7 glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate, and Ethyl 17-L[
8 (2'-O-
9 β-D-
10 glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate.

1 7. The method as claimed in Claim 2, wherein the sophorolipid is 17-L-[
2 (2'-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate based.

1 8. The method as claimed in Claim 7, wherein the 17-L-[
2 (2'-O-β-D-
3 glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate based sophorolipid is
4 selected from the group consisting of 17-L-[
5 (2'-O-β-D-glucopyranosyl-β-D-
6 glucopyranosyl)-oxy]-cis-9-octadecenoate-6',6"-diacetate, Hexyl 17-L[
7 (2'-O-β-D-
8 glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate, and Ethyl 17-L[
9 (2'-O-
10 β-D-
11 glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate.

1 9. The method as claimed in Claim 3, wherein the sophorolipid is 17-L-[
2 (2'-O-β-D-glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate based.

1 10. The method as claimed in Claim 9, wherein the 17-L-[
2 (2'-O-β-D-
3 glucopyranosyl-β-D-glucopyranosyl)-oxy]-cis-9-octadecenoate based sophorolipid is
4 selected from the group consisting of 17-L-[
5 (2'-O-β-D-glucopyranosyl-β-D-

4 glucopyranosyl)-oxy]-cis-9-octadecenoate-6',6"-diacetate, Hexyl 17-L[(2'-O- β -D
5 glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-octadecenoate, and Ethyl 17-L[(2'-O-
6 β -D glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-octadecenoate.

1 11. The method as claimed in Claim 4, wherein the sophorolipid is 17-L-[
2 [(2'-O- β -D-glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-octadecenoate based.

1 12. The method as claimed in Claim 11, wherein the 17-L-[(2'-O- β -D-
2 glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-octadecenoate based sophorolipid is
3 selected from the group consisting of 17-L-[(2'-O- β -D-glucopyranosyl- β -D-
4 glucopyranosyl)-oxy]-cis-9-octadecenoate-6',6"-diacetate, Hexyl 17-L[(2'-O- β -D
5 glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-octadecenoate, and Ethyl 17-L[(2'-O-
6 β -D glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-octadecenoate.

1 13. A method for inactivating spermatozoa using 17-L-[(2'-O- β -D-
2 glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-octadecenoate based sophorolipids.

1 14. The method as claimed in Claim 13, wherein the 17-L-[(2'-O- β -D-
2 glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-octadecenoate based sophorolipid is
3 selected from the group consisting of 17-L-[(2'-O- β -D-glucopyranosyl- β -D-
4 glucopyranosyl)-oxy]-cis-9-octadecenoate-6',6"-diacetate, Hexyl 17-L[(2'-O- β -D
5 glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-octadecenoate, and Ethyl 17-L[(2'-O-
6 β -D glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-octadecenoate.

1 15. A method for neutralizing or inactivating viruses using 17-L-[(2'-O- β -D-
2 glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-octadecenoate based sophorolipids.

1 16. The method as claimed in Claim 15, wherein the 17-L-[(2'-O- β -D-
2 glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-octadecenoate based sophorolipid is
3 selected from the group consisting of 17-L-[(2'-O- β -D-glucopyranosyl- β -D-
4 glucopyranosyl)-oxy]-cis-9-octadecenoate-6',6"-diacetate, Hexyl 17-L[(2'-O- β -D
5 glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-octadecenoate, and Ethyl 17-L[(2'-O-
6 β -D glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-octadecenoate.

1 17. A method for neutralizing or inactivating HIV using 17-L-[(2'-O- β -D-
2 glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-octadecenoate based sophorolipids.

1 18. The method as claimed in Claim 17, wherein the 17-L-[(2'-O- β -D-
2 glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-octadecenoate based sophorolipid is
3 selected from the group consisting of 17-L-[(2'-O- β -D-glucopyranosyl- β -D-
4 glucopyranosyl)-oxy]-cis-9-octadecenoate-6',6"-diacetate, Hexyl 17-L-[(2'-O- β -D-
5 glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-octadecenoate, and Ethyl 17-L-[(2'-O-
6 β -D glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-octadecenoate.

1 19. A sophorolipid compound having the formula 17-L-[(2'-O- β -D-
2 glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-octadecenoate-6',6"-diacetate.

1 20. The sophorolipid compound as claimed in Claim 19 having spermicidal
2 properties.

1 21. The sophorolipid compound as claimed in Claim 19 having antiviral
2 properties.

1 22. A sophorolipid compound having the formula Ethyl 17-L-[(2'-O- β -D-
2 glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-octadecenoate.

1 23. The sophorolipid compound as claimed in Claim 22 having spermicidal
2 properties.

1 24. The sophorolipid compound as claimed in Claim 22 having antiviral
2 properties.

1 25. A sophorolipid compound having the formula Hexyl 17-L-[(2'-O- β -D-
2 glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-octadecenoate.

1 26. The sophorolipid compound as claimed in Claim 25 having spermicidal
2 properties.

1 27. The sophorolipid compound as claimed in Claim 25 having anti-viral
2 properties.

1 28. The method as claimed in Claim 1, wherein the sophorolipid compound
2 is delivered in a form selected from the group consisting of a gel, a film, a foam, a
3 suppository, a pessary, a liposomal formulation, and as a liquid imbibed in a sponge.

1 29. The method as claimed in Claim 2, wherein the sophorolipid compound
2 is delivered in a form selected from the group consisting of a gel, a film, a foam, a
3 suppository, a pessary, a liposomal formulation, and as a liquid imbibed in a sponge.

1 30. The method as claimed in Claim 3, wherein the sophorolipid compound
2 is delivered in a form selected from the group consisting of a gel, a film, a foam, a
3 suppository, a pessary, a liposomal formulation, and as a liquid imbibed in a sponge.

1 31. The method as claimed in Claim 4, wherein the sophorolipid compound
2 is delivered in a form selected from the group consisting of a gel, a film, a foam, a
3 suppository, a pessary, a liposomal formulation, as a liquid imbibed in a sponge, and
4 as a liquid being released from an intravaginal or intrauterine delivery system.

1 32. The sophorolipid compound as claimed in Claim 19, wherein the
2 sophorolipid compound is in a form selected from the group consisting of a gel, a
3 film, a foam, a suppository, a pessary, a liposomal formulation, as a liquid imbibed in
4 a sponge, and as a liquid being released from an intravaginal or intrauterine delivery
5 system.

1 33. The sophorolipid compound as claimed in Claim 20, wherein the
2 sophorolipid compound is delivered in a form selected from the group consisting of a
3 gel, a film, a foam, a suppository, and a pessary.

1 34. The sophorolipid compound as claimed in Claim 21, wherein the
2 sophorolipid compound is delivered in a form selected from the group consisting of a
3 liposomal formulation, as a liquid imbibed in a sponge, and as a liquid being released
4 from an intravaginal or intrauterine delivery system.

1 35. The sophorolipid compound as claimed in Claim 23, wherein the
2 sophorolipid compound is delivered in a form selected from the group consisting of a
3 gel, a film, a foam, a suppository, and a pessary.

1 36. The sophorolipid compound as claimed in Claim 24, wherein the
2 sophorolipid compound is delivered in a form selected from the group consisting of a
3 liposomal formulation, as a liquid imbibed in a sponge, and as a liquid being released
4 from an intravaginal or intrauterine delivery system.

1 37. The sophorolipid compound as claimed in Claim 26, wherein the
2 sophorolipid compound is delivered in a form selected from the group consisting of a
3 gel, a film, a foam, a suppository, and a pessary.

1 38. The sophorolipid compound as claimed in Claim 27, wherein the
2 sophorolipid compound is delivered in a form selected from the group consisting of a

3 liposomal formulation, as a liquid imbibed in a sponge, and as a liquid being released
4 from an intravaginal or intrauterine delivery system.

1 39. The application of a sophorolipid synthesized by fermentation of
2 *Candida bombicola* in a fermentation media to form a natural mixture of lactonic
3 sophorolipids and non-lactonic sophorolipids in combination with at least one
4 sophorolipid selected from the group consisting of:

- 5 a. 17-L-[(2'-O- β -D-glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-
6 octadecenoate-6',6"-diacetate;
- 7 b. Ethyl 17-L-[(2'-O- β -D-glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-
8 octadecenoate;
- 9 c. Hexyl 17-L-[(2'-O- β -D-glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-
10 octadecenoate; and
- 11 d. combinations thereof,

12 as antiviral agents.

1 40. The application of a sophorolipid synthesized by fermentation of
2 *Candida bombicola* in a fermentation media to form a natural mixture of lactonic
3 sophorolipids and non-lactonic sophorolipids in combination with at least one
4 sophorolipid selected from the group consisting of:

- 5 a. 17-L-[(2'-O- β -D-glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-
6 octadecenoate-6',6"-diacetate;
- 7 b. Ethyl 17-L-[(2'-O- β -D-glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-
8 octadecenoate;
- 9 c. Hexyl 17-L-[(2'-O- β -D-glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-
10 octadecenoate; and
- 11 d. combinations thereof,

12 as spermicidal agents.

1 41. The application of the sophorolipid as claimed in Claim 19 in
2 combination with at least one sophorolipid selected from the group consisting of:

- 3 a. Sophorolipids synthesized by fermentation of *Candida bombicola* in a
4 fermentation media to form a natural mixture of lactonic sophorolipids
5 and non-lactonic sophorolipids;
- 6 b. Ethyl 17-L-[(2'-O- β -D-glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-
7 octadecenoate;
- 8 c. Hexyl 17-L-[(2'-O- β -D-glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-
9 octadecenoate; and
- 10 d. combinations thereof,

11 as antiviral agents.

- 1 42. The application of the sophorolipid as claimed in Claim 19 in
2 combination with at least one sophorolipid selected from the group consisting of:
3 a. Sophorolipid synthesized by fermentation of *Candida bombicola* in a
4 fermentation media to form a natural mixture of lactonic sophorolipids
5 and non-lactonic sophorolipids;- 6 b. Ethyl 17-L-[(2'-O- β -D-glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-
7 octadecenoate;
- 8 c. Hexyl 17-L-[(2'-O- β -D-glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-
9 octadecenoate; and
- 10 d. combinations thereof,

11 as spermicidal agents.

- 1 43. The application of the sophorolipid as claimed in Claim 22 in
2 combination with at least one sophorolipid selected from the group consisting of:
3 a. Sophorolipid synthesized by fermentation of *Candida bombicola* in a
4 fermentation media to form a natural mixture of lactonic sophorolipids
5 and non-lactonic sophorolipids;- 6 b. 17-L-[(2'-O- β -D-glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-
7 octadecenoate-6',6"-diacetate;
- 8 c. Hexyl 17-L-[(2'-O- β -D-glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-
9 octadecenoate; and
- 10 d. combinations thereof,

11 as antiviral agents.

- 1 44. The application of the sophorolipid as claimed in Claim 22 in
2 combination with at least one sophorolipid selected from the group consisting of:
3 a. Sophorolipid synthesized by fermentation of *Candida bombicola* in a
4 fermentation media to form a natural mixture of lactonic sophorolipids
5 and non-lactonic sophorolipids;
6 b. 17-L-[(2'-O- β -D-glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-
7 octadecenoate-6',6"-diacetate;
8 c. Hexyl 17-L-[(2'-O- β -D-glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-
9 octadecenoate; and
10 d. combinations thereof,

11 as spermicidal agents.

- 1 45. The application of the sophorolipid as claimed in Claim 25 in
2 combination with at least one sophorolipid selected from the group consisting of:
3 a. Sophorolipid synthesized by fermentation of *Candida bombicola* in a
4 fermentation media to form a natural mixture of lactonic sophorolipids
5 and non-lactonic sophorolipids;
6 b. 17-L-[(2'-O- β -D-glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-
7 octadecenoate-6',6"-diacetate;
8 c. Ethyl 17-L-[(2'-O- β -D-glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-
9 octadecenoate; and
10 d. combinations thereof,

11 as antiviral agents.

- 1 46. The application of the sophorolipid as claimed in Claim 25 in
2 combination with at least one sophorolipid selected from the group consisting of:
3 a. Sophorolipid synthesized by fermentation of *Candida bombicola* in a
4 fermentation media to form a natural mixture of lactonic sophorolipids
5 and non-lactonic sophorolipids;
6 b. 17-L-[(2'-O- β -D-glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-
7 octadecenoate-6',6"-diacetate;

8 c. Ethyl 17-L-[(2'-O- β -D-glucopyranosyl- β -D-glucopyranosyl)-oxy]-cis-9-
9 octadecenoate; and
10 d. combinations thereof,
11 as spermicidal agents.

1 47. The application of the sophorolipids as claimed in Claim 1 in
2 combination with known antiviral agents.

1 48. The application of the sophorolipids as claimed in Claim 1 in
2 combination with known spermicidal agents.

1 49. The application of the sophorolipids as claimed in Claim 17 in
2 combination with known antiviral agents.

1 50. The application of the sophorolipids as claimed in Claim 17 in
2 combination with known spermicidal agents.

1 51. The application of the sophorolipids as claimed in Claim 20 in
2 combination with known antiviral agents.

1 52. The application of the sophorolipids as claimed in Claim 21 in
2 combination with known spermicidal agents.

1 53. The application of the sophorolipids as claimed in Claim 23 in
2 combination with known antiviral agents.

1 54. The application of the sophorolipids as claimed in Claim 24 in
2 combination with known spermicidal agents.